Semantic Web Tools

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Semantic Web

“The Semantic Web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries” - http://www.w3.org/2001/sw/

- RDF & OWL – w3c standards for encoding data and its semantics

- There isn’t enough semantic web content on web
Piggy Bank

“Semantic Web Browser” by people of the SIMILE project at MIT

Available as a Firefox plug-in at http://simile.mit.edu/piggy-bank/

Can ingest RDF data directly from websites that contain meta information, and can execute screen-scrapers to extract content from normal websites and then convert that data to RDF
Piggy Bank

Features of the browser:

- Tagging – Tag pages and individual items
- Navigation – Selection on features
- Export data in RDF/n3
Solvent

- Screen-Scraper developed by the SIMILE project
- Installs as a Firefox plug-in
- Extracts data and exports it as RDF/n3
Piggy Bank and Solvent Demo
Jena

A Semantic Web Framework that includes:

- A RDF API
- Reading and writing RDF in RDF/XML, N3 and N-Triples
- An OWL API
- In-memory and persistent storage
- SPARQL query engine

Documentation available at http://jena.sourceforge.net/documentation.html
Using Jena API – An Example

```java
import com.hp.hpl.jena.query.*;
import com.hp.hpl.jena.rdf.model.*;

//Create a default model and add statements from a file into it
Model model = ModelFactory.createDefaultModel();
InputStream in = new FileInputStream(new File(filename));
model.read(in, null);

//Now can add statements to the model, can query the model etc

//Write the model to a PrintStream, in say N3 notation
model.write(System.out, "N3");
```
ARQ

ARQ is Jena’s implementation of SPARQL.

ARQ documentation is available at: http://jena.sourceforge.net/ARQ/documentation.html

Can write queries using the Jena Java API or can write them in text files and execute them using ARQ’s command line utility.
PREFIX SM: <http://simile.mit.edu/2005/05/ontologies/location#>
PREFIX DC: <http://purl.org/dc/elements/1.1/>

SELECT DISTINCT ?title ?address
FROM <sources/starbucks.n3>
WHERE {
    ?x SM:address ?address .
}
PREFIX SM: <http://simile.mit.edu/2005/05/ontologies/location#>
PREFIX DC: <http://purl.org/dc/elements/1.1/>

SELECT DISTINCT ?title ?address
FROM <sources/starbucks.n3>
WHERE {
  ?x SM:address ?address .
  FILTER (regex(?address, "Figueroa", "i")) .
}

regex is a X-Path function. Other functions available at http://jena.sourceforge.net/ARQ/library.html
Querying multiple sources, Using simple JOIN

PREFIX SM: <http://simile.mit.edu/2005/05/ontologies/location#>
PREFIX DC: <http://purl.org/dc/elements/1.1/>
PREFIX fn: <http://www.w3.org/2005/xpath-functions#>

SELECT DISTINCT ?title ?zip ?temperature
FROM NAMED <sources/starbucks.n3>
FROM NAMED <sources/weather.n3>
WHERE {
  GRAPH <sources/starbucks.n3> {
  }.
  GRAPH <sources/weather.n3> {
  }.
}.
Example of Inference

http://swui.semanticweb.org/swui.rdf

- List of publications accepted at the SWUI workshop, giving its title, author and keywords

http://139.91.183.30:9090/RDF/VRP/Examples/ACM-CSS.rdf

- ACM computer Classification System
Query: Get all papers published in SWUI that belong to the Software category

Data:
X keyword "interoperability"
Y keyword “semantics”

Solution:
Without Inference: No solution
With inference – X and Y
Using Inference

```java
import com.hp.hpl.jena.query.*;
import com.hp.hpl.jena.rdf.model.*;

Model model = ModelFactory.createDefaultModel();
model.read("http://swui.semanticweb.org/swui.rdf");
model.read("http://139.91.183.30:9090/RDF/VRP/Examples/ACM-CSS.rdf");

InfModel inf = ModelFactory.createRDFSModel(model);
//RDFS Model includes RDFS entailments like subClassOf reasoning

Query query = QueryFactory.create(queryString);
QueryExecution qe = QueryExecutionFactory.create(query, inf);
ResultSet results = qe.execSelect();
ResultSetFormatter.out(System.out, results, query);
```
Links

- Solvent - [http://simile.mit.edu/solvent/](http://simile.mit.edu/solvent/)
- Jena Documentation - [http://jena.sourceforge.net/documentation.html](http://jena.sourceforge.net/documentation.html)
- ARQ Documentation - [http://jena.sourceforge.net/ARQ/documentation.html](http://jena.sourceforge.net/ARQ/documentation.html)